

The Effects of Artificial Lighting on Sea Turtles



Building, Zoning and Planning Department

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Teal Kawana, Oceanfront Lighting and Marine Turtle Code Enforcement Officer

Overview

- **Background on Sea Turtles**
- **Nesting/Hatching**
- **Threats to Sea Turtles**
- **Light Pollution and its Effects on Sea Turtles**
- **The Village of Key Biscayne Lighting Ordinance**
- **Non-Friendly vs Friendly Lighting**
- **Safe Coastal Lighting Techniques**
- **Ongoing outreach / more information**

Background

- 7 species of sea turtles, 5 reside in Florida's waters, 3 nesting
- Date back to over 100 million years
- Air-breathing, marine reptiles
- Grow slowly and have a life-span of many decades
- Protected by the Endangered Species Act



South Florida's Nesting Sea Turtles



Loggerhead-*Caretta caretta*



Green-*Chelonia mydas*



Leatherback-*Dermochelys coriacea*

Protection of Sea Turtles

- In the US and its territories: the Endangered Species Act of 1973 prohibits all killing, harming, and harassment of sea turtles
- In Florida: Protected by Florida Marine Turtle Protection Act, Chapter 370.12, FL Statutes
- In Key Biscayne: (Ord. No. 2009-6, §2 , 5-12-09), Lighting Regulations for Marine Turtle Protection



Sea Turtle Nesting

- Nesting season: April – Sept.
- Hatching season: June – Oct.
- Nocturnal
- Deposits her leathery, “ping-pong-like” eggs
- 2 – 7 nests per season depending on species
- Higher nesting on new and full moons due to tide cycles



Photo courtesy Blair Witherington

Sea Turtle Hatching

- Eggs incubate for ~ 45 to 55 days before hatching
- Gender is determined by temperature
- Emergence is a group effort
- Hatchlings wait for temperature to drop (night time) to emerge
- Head towards the sea to swim non-stop for 24-36 hours to their “nursery” locations



Hatching

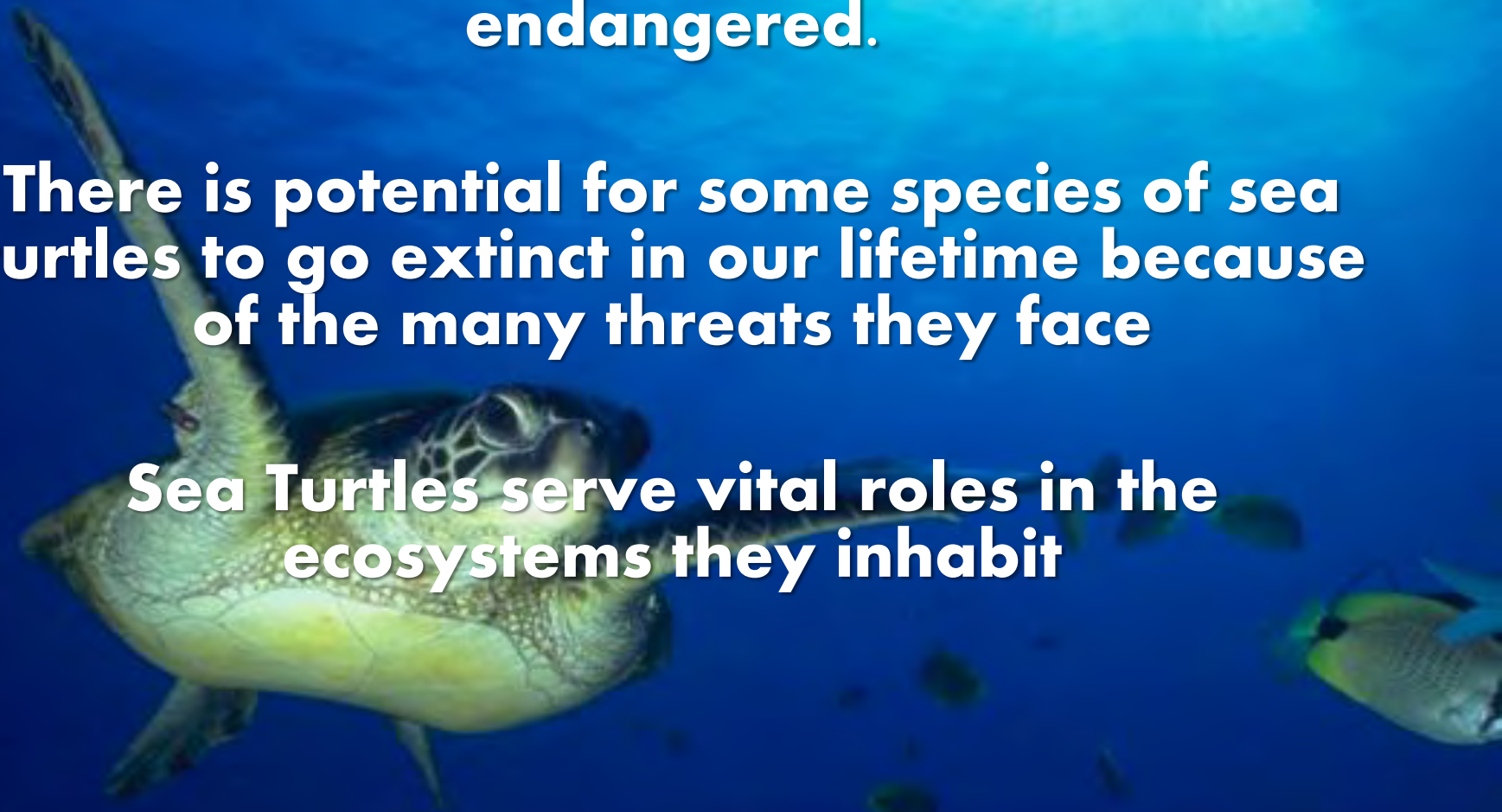


Why is Sea Turtle Conservation Important?

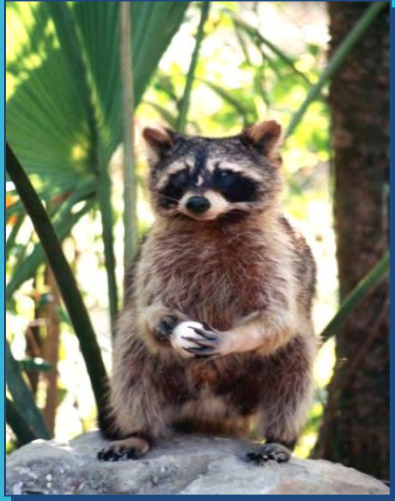
All species of sea turtles are either threatened, endangered or critically endangered.

There is potential for some species of sea turtles to go extinct in our lifetime because of the many threats they face

Sea Turtles serve vital roles in the ecosystems they inhabit



Threats to Sea Turtles



Predation

Pollution

Chemicals – Oil spills

Fibropapilloma virus



Threats to Sea Turtles



Fishing nets, lines and hooks

-Solution, TEDs



Poaching

Boat traffic



Threats to Sea Turtles



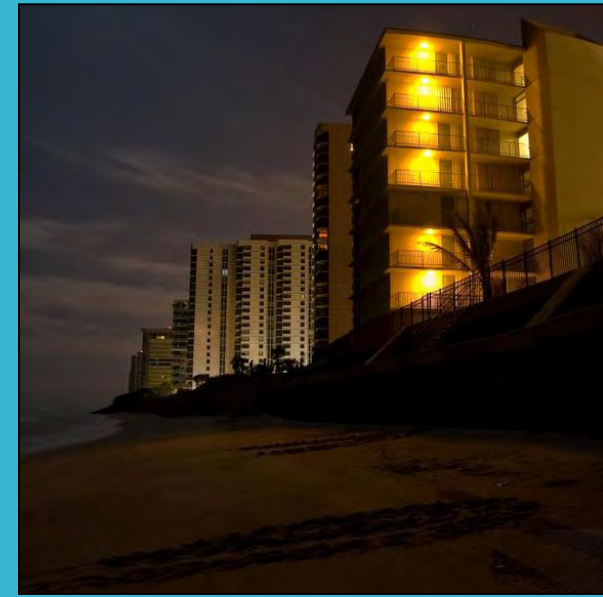
Coastal Development

Beach Erosion

Beach Furniture

Coastal Lighting

– Light Pollution!



What is Light Pollution?

- The introduction of excessive or obtrusive artificially produced light into the environment



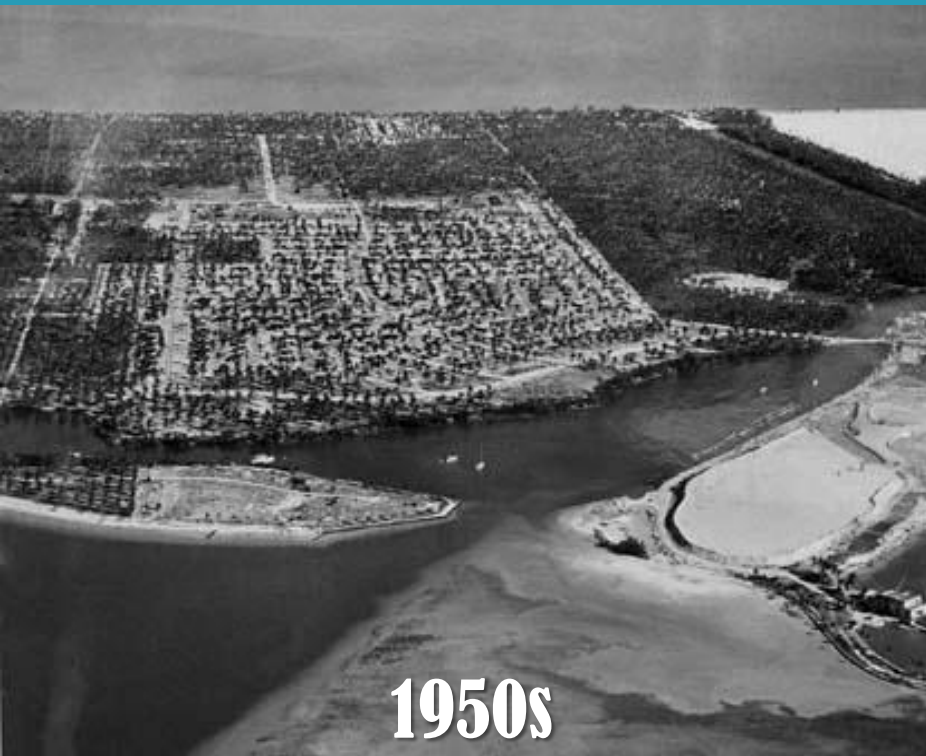
Miami/Key
Biscayne

Coastal Light Pollution

- Florida's beach environment has dramatically changed in last few decades
 - Development, construction, increases in population (residents and visitors)
- Effects Sea Turtle populations
 - Nesting site selection by adults
 - Movement off the beach by hatchlings



Key Biscayne, then and now!




90% of sea turtles in the US nest in FL and majority of FL's population resides on the coasts

Problems with Coastal Lighting for Sea Turtles

Nesting Females

- Deters them from coming ashore
- May return to ocean without laying eggs
- Lay eggs in unsuitable location after several attempts
- May spend extra energy walking on beach before or after laying eggs, unable to find the ocean
- Higher nesting on darker beaches





**Today Light Pollution causes the
biggest loss of sea turtle hatchlings!**

11.17.2011 20:13

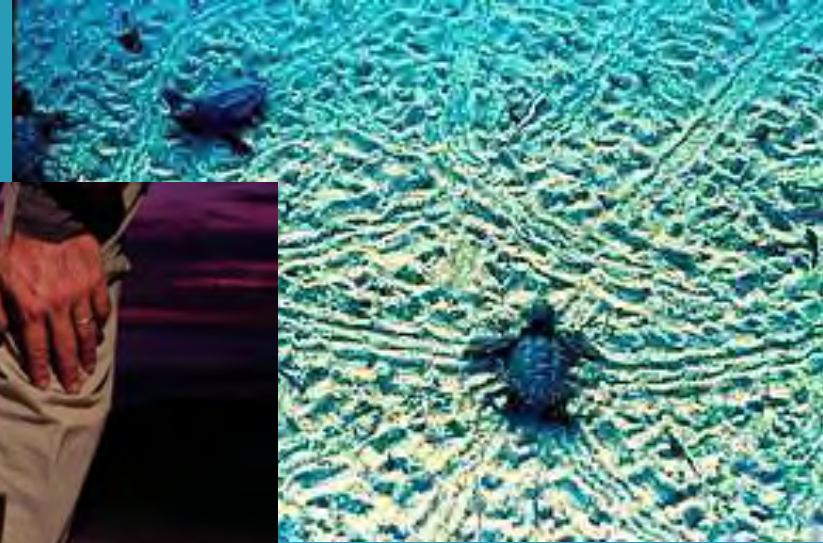
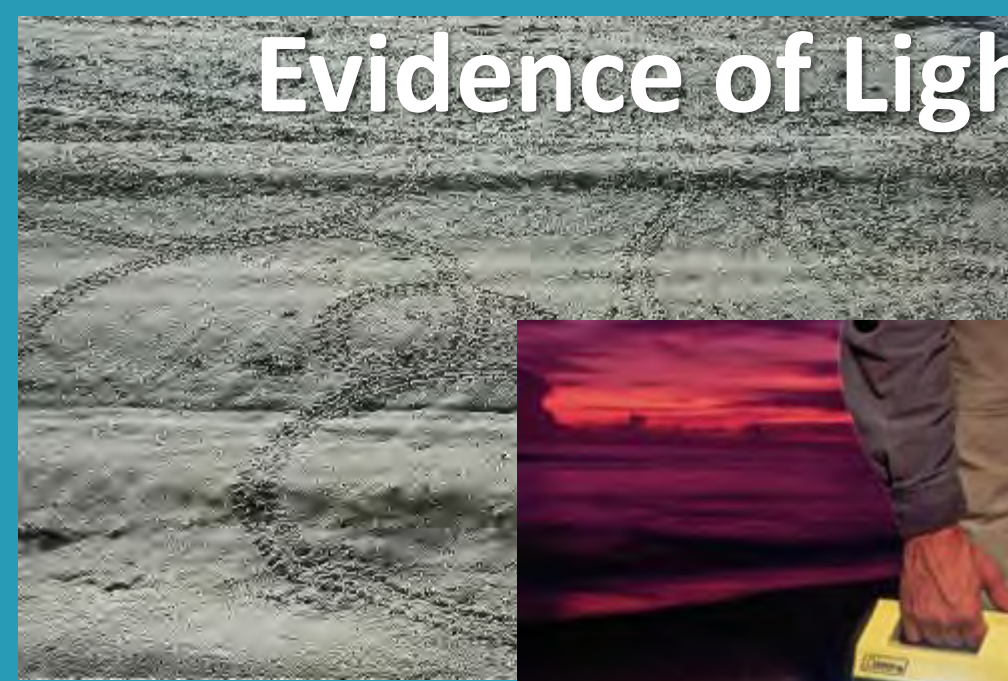
Problems with Coastal Lighting for Sea Turtles

Hatchlings

- Instinct: to go to the brightest horizon which should be the reflection of the night sky on the ocean
- Artificial lighting disorients hatchlings
- In most coastal areas - sky over the dunes is lit up by artificial lights
- Hatchlings crawl away from ocean: more susceptible to death by dehydration, predators, exhaustion and the street



Evidence of Light Disruptions...



Disoriented Hatchlings



Photo, T Kawana

Only **1 out of 1000**
hatchlings that make it to
the water are thought to
survive to adulthood!

**CONSERVATION
IS THE KEY TO
SUCCESS!**





The Good News



- Light pollution on beaches is easy to fix!
- A small effort on our part could aid in the survival of thousands of sea turtles
 - There are plenty of solutions to change our lighting so that it's “sea turtle friendly”



The Goal

- Aid condominiums and hotels in The Village of Key Biscayne to modify or remove lights disorienting sea turtles and incorporate sea turtle friendly fixtures and bulbs in an effort to decrease disorientations and improve nesting habitat degraded by light pollution

Development of a Lighting Ordinance

- Village required by Florida Fish & Wildlife Conservation Commission (FWC) & Florida Department of Environmental Protection (DEP) to adopt a lighting ordinance
 - Key Biscayne (Ord. No. 2009-6, §2 , 5-12-09)
Lighting Regulations for Marine Turtle Protection



Key Biscayne Ordinance

(Ord. No. 2009-6, §2 , 5-12-09)

Standards for Existing Lighting

- reposition fixtures so the light is no longer visible on/from the beach
- replace fixtures having an exposed light source (i.e. globe lights, spotlights, pole lights, etc.)
 - Use ones containing recessed light sources or shields
- replace traditional light bulbs
 - not exceeding 50 watts, red or amber approved bulbs, red or amber LED
- replace non-directional fixtures
 - Use ones pointing down and away from the beach

Key Biscayne Ordinance

(Ord. No. 2009-6, §2 , 5-12-09)

Standards for Existing Lighting

- replace fixtures having transparent/translucent coverings
 - Use ones with opaque shields covering at least 180 degrees and extending an appropriate distance below the bottom edge of the fixture on the seaward side
- replace pole lamps
 - Use low-profile, low-level luminaires
- replace incandescent, fluorescent and high intensity lighting
 - Use low watt, low pressure sodium vapor lighting
- plant or improve vegetation buffers
- construct a ground level barrier shield
 - Cannot interfere with the dune system or turtle nesting



Key Biscayne Ordinance

(Ord. No. 2009-6, §2 , 5-12-09)

- Lighting Standards for New Development
 - Follow same standards as existing lighting
 - Required to comply with ordinance when making building plans
 - Marine Turtle Lighting Review required by VKB



Lighting Inspections

- Compliance within 48 months of the adoption of the ordinance (~April 2013)
- Lighting Inspections
 - Preliminary Daytime and Nighttime Inspections
 - Looking for any lighting directed towards the beach or illuminating the beach (direct and indirect light) that can affect a sea turtle
 - Notifying properties of lighting violations
 - Working with management to gain compliance
- Continuing Inspections throughout nesting season

Unsafe lighting

- Globe/Acorn lights
- Carriage lights
- Spotlights, floodlights
- Ceiling fixtures with refracting globes or convex lenses
- Decorative landscape lighting
- Unshielded wall sconces
- Fluorescent Tube lighting for garages



Non-friendly vs Friendly Wall Mount Lighting



NON-FRIENDLY



NON-FRIENDLY



NON-FRIENDLY



NON-FRIENDLY



NON-FRIENDLY



FRIENDLY



FRIENDLY



FRIENDLY



FRIENDLY

Non-friendly vs Friendly Ceiling Fixtures



NON-FRIENDLY



NON-FRIENDLY



NON-FRIENDLY



FRIENDLY



FRIENDLY



FRIENDLY

Non-friendly vs Friendly Yard Lighting



NON-FRIENDLY



NON-FRIENDLY



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NON-FRIENDLY



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FRIENDLY

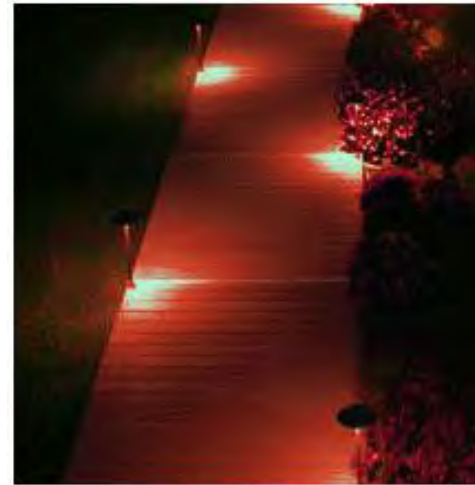


FRIENDLY

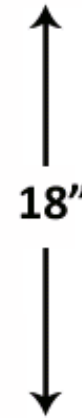
Non-friendly vs Friendly Landscape and Pathway Lighting



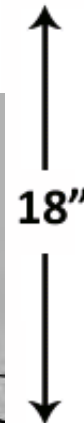
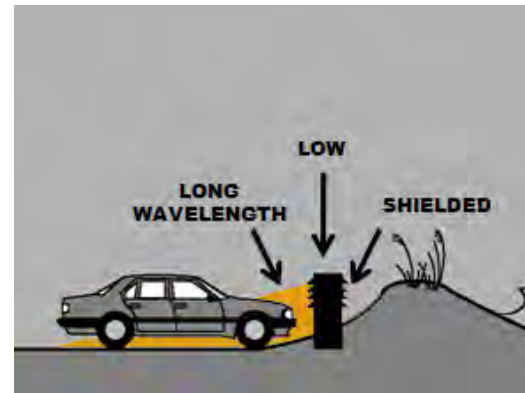
NON-FRIENDLY



FRIENDLY



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Sea Turtle Safe Lighting



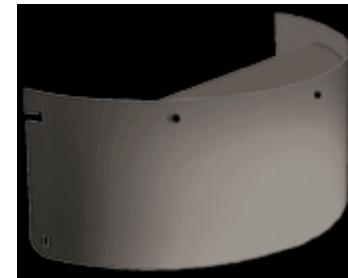
Recessed and wall mounted step lights



Red and Amber LED bulbs



Window Film/Tint



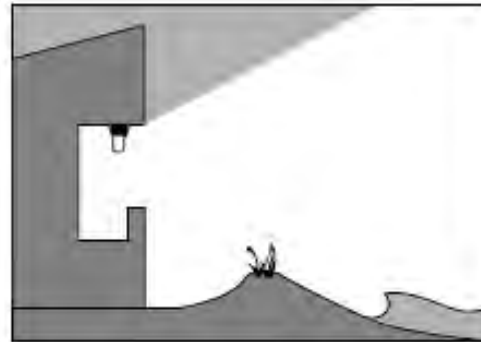
Shields/Shades

Minimize Outdoor Lighting

- Turn lighting off
- Reduce wattage of problem lighting, use Amber or Red LED
- Use directional luminaires. Do not direct lighting onto beach
- Replace bright pathway lighting with sunken strip lights or low 18-in shielded, louvered fixtures
- Shield lighting sources from the beach
 - Opaque, large shields
- Recess luminaires into roof soffits
- Use low mounted fixtures with louvers or bollards as a substitute for tall pole mounted fixtures
- Reposition lights so natural shields (vegetation, buildings) block light
- Install motion detectors on lights used for security or safety

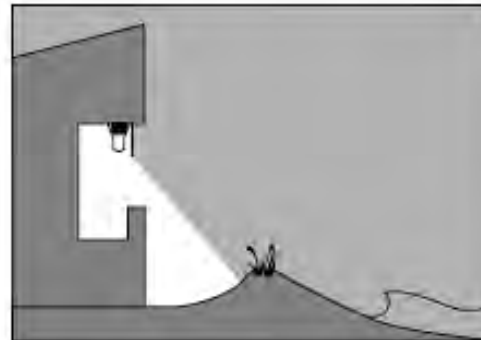
Minimize Indoor Lighting Sources

- Turn lighting off when not in use
- Relocate moveable lamps away from windows
- Tint (45% or less) or apply window treatments
- Close opaque curtains and blinds
- Change/Redirect balcony lighting



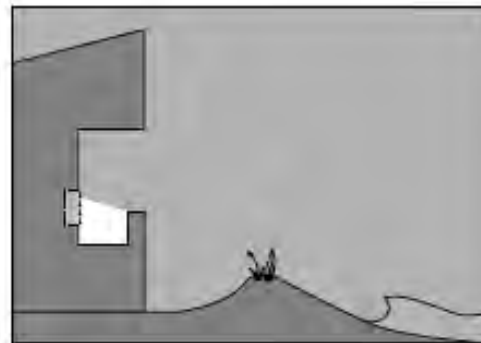
POOR

Poorly directed balcony lighting can cause problems on sea turtle nesting beaches.



BETTER

Completely shielding fixtures with a sheet of metal flashing can reduce stray light reaching the beach.



BEST

Louvered step lighting is one of the best ways to light balconies that are visible from nesting beaches.

Benefits of Sea Turtle Safe Lighting

- Helping sea turtles survive!
- Significant reductions in disorientations on beaches with new sea turtle safe lighting
- Decrease in monthly electric bills with Amber LED's
 - (70% more efficient than incandescent bulbs)
- Modernized aesthetically pleasing fixtures
- More pleasing glow to landscape, (candlelight) with less glare



Successful Solutions in Florida...

DARK SKIES **SAVE**
SEA TURTLES' **LIVES**

LIGHTS OUT MAY 1 – OCTOBER 31

Pathway

Learn effective methods of shielding

Pool

Enhance the beauty of your property!

Parking

Sea Turtle Lighting keeps residents and guests safe, but It keeps an endangered species alive!

Balcony

Effective Sea Turtle Lighting leaves them in the dark.... Not You!

Before/After

Martinique Condominium, Holmes Beach, FL

Manatee County



Before/After

Boca Mar Condominium, Boca Raton, FL

Palm Beach County



Before/After

Gulf Shores, Holmes Beach, FL

Manatee County





**An excellent hatching on a dark beach.
All tracks lead straight to the water!**

Ongoing Village Outreach

- Compliance!
- Oceanfront Buildings Manager Contact and Education
 - Liaison between condos/hotels and lighting manufacturers
- Resident Education
 - Handouts, letters, brochures, postcards
 - Islander News
 - Presentations
- Outreach Program
 - Community Organizations
 - Schools



DARK SKIES SAVE SEA TURTLES' LIVES

LIGHTS OUT MAY 1 - OCTOBER 31

Residents' help needed for sea turtle season

By: KELLY JOSEPHSEN
kjosephsen@islandernews.com

Teal Kawana has devoted her education and career to protecting sea turtles – she's picked hatchlings out of sewers and off busy highways, and has housed 100s of the creatures in buckets in her home – and now she's sharing her knowledge during a presentation next week.

The local sea turtle nesting season is May 1 through October 30; the area that includes Crandon Park, Village beaches and Bill Baggs Cape Florida State Park sees on average 135 nests a year.

Kawana, the Village's Oceanfront Lighting and Marine Turtle Code Enforcement Officer, will be in the Village Council Chambers Wednesday, May 2, at 3 p.m. for the Oceanfront Lighting and Marine Turtle Public Outreach Program. She'll discuss the effects of artificial lighting on nesting female turtles and their hatchlings, and advise residents how to help protect the crea-

tures.

The presentation will be televised and replayed on the Village TV station, channel 77.

"Right now, the best thing is awareness," said Kawana, who is clearly in the right field: not only does she care deeply about protecting turtles, having spent the last four years completing a Master's thesis on the creatures at Nova Southeastern University; she also was recently told by a leading sea turtle expert that her last name is the Caribe word for loggerhead turtles.

She came to Key Biscayne last October to spearhead enforcement of the Village's Oceanfront and Marine Turtle Lighting Ordinance.

Therefore, along with reaching out to residents, Kawana has been working with oceanfront condominium managers to ensure compliance with the ordinance – aimed at keeping artificial light from illuminating any area within direct line of sight of the beach – by next May's deadline.



Teal Kawana, the Village's Oceanfront Lighting and Marine Turtle Code Enforcement Officer, will be in the Village Council Chambers for the Oceanfront Lighting and Marine Turtle Public Outreach Program.

Her May 2 presentation will focus not only on how residents can help

protect turtles, but how oceanfront properties can meet the requirements of the law.

Tips for compliance

Kawana said she's been getting good cooperation from property managers in terms of installing sea turtle-friendly ground-level lighting and lighting around pools, and now she's starting to also focus on balcony lighting, which is more challenging because success requires cooperation from thousands of individual unit owners.

Kawana hopes by hosting next week's presentation and other outreach events, as well as working with the local media and asking condo managers to provide residents with an informational letter on sea turtles, she can let people know about the rules.

Fortunately, she said, the steps residents can take to help are fairly simple. Along with turning off lights or pulling the shades after 9 p.m.,

See **TURTLES** p.4A

FOR MORE INFORMATION ABOUT SEA TURTLES AND LIGHTING...

Websites:

www.seaturtlelighting.net
www.myfwc.com
www.starrynightlights.com
www.darksky.org
www.seaturtlestatus.org
www.conserveturtles.org
www.seaturtle.org
www.nmfs.gov
www.savetheseaturtle.org

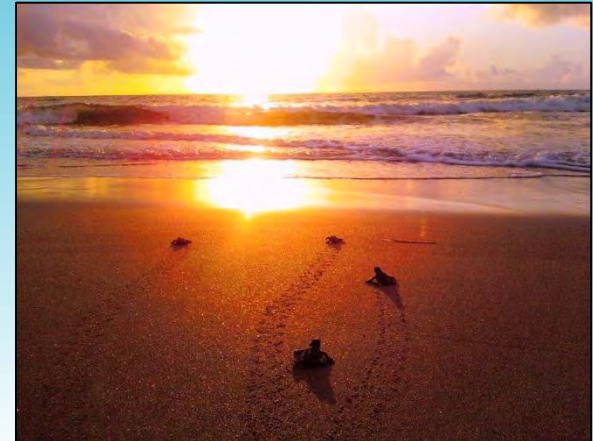
Places to visit:

Crandon Park Nature Center
The Miami Seaquarium
The Turtle Hospital, Marathon Key
Gumbo Limbo Nature Center, Boca Raton
Marine Life Center, Juno Beach
Sea World, Orlando
Mote Marine Lab, Sarasota

Photo William Buck

ACKNOWLEDGEMENTS

- **Village of Key Biscayne**
 - **Sea Turtle Conservancy, Karen Shudes**
 - **Crandon Park Nature Center**
- **Bill Ahern, Miami-Dade County permit holder**
 - **Eco-adventures**
 - **seaturtle.org**
 - **US Fish and Wildlife**
- **Florida Fish and Wildlife Conservation Commission, Karen Schanzle**
 - **Broward County Sea Turtle Conservation Program**
 - **conserveturtles.org**
 - **Coastal Systems**
 - **NMFS**
- **Greeneearthlighting.com**
 - **Electro Elf**
 - **Bulbtronics, Miami**
 - **Sesco turtle lighting**
 - **RAB lighting**
 - **Seaturtlestatus.org**



A photograph of two small sea turtles, likely hatchlings, on a sandy beach. The turtles are dark-colored with lighter patterns on their shells. They are positioned in the lower half of the frame, with one slightly ahead of the other. The background is a vast, flat expanse of sand. The image has a soft, slightly blurred quality.

“There is no civilized way to escape the obligation to save them.”

- DR. ARCHIE CARR -